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APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: **PROGRAMMABLE SPARRING PARTNER**

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TITLE

Programmable Sparring Partner

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

Not Applicable

BACKGROUND OF THE INVENTION

Tae Kwon Do has three main components: 1) Forms (patterns) 2) Self-defense and 3) Sparring (Olympic style). This present invention is intended to aid a Tae Kwon Do or martial arts practitioner in improving their sparring techniques. In a typical Tae Kwon Do class setting, students practice sparring by partnering up with a student. One student attacks by throwing various combinations of fakes and kicks, while the other student counters their movements.

In a class situation, safety always comes first. Thus, when one student is either attacking or counter attacking, the student cannot kick with full force. Restraining a student's kicking force significantly hinders the student's ability to improve his sparring skills for tournaments.

There are aids for improving the sparring techniques of a Tae Kwon Do or martial arts practitioner. Some of these aids are hanging punching bags and standing punching bags, which are either filled with water or sand to absorb the punches and kicks. Another sparring aid in the market is Century's BOB (Body Opponent Bag); this kicking and punching equipment has a torso that looks like a human torso, which gives the user a feeling of attacking an actual person. The draw back of BOB and hanging or standing punching bags is that they are static objects, which do not give the person using it the ability to work on their timing. U.S Pat. No. 5,048,822 is a sparring apparatus that is similar to a hanging punching bag, except for the punching bag is attached to a circular track, which allows the punching bag to move in a circle. The draw back to this sparring apparatus is the sparring apparatus is predictable, since the punching bag is moving on a circular track.

There yet remains a need for a sparring apparatus with movements that are random, as well as a need for the ability to program a random but specific sparring sequence.

All US patents and applications and all other published documents mentioned anywhere in this application are incorporated herein by reference in their entirety.

Without limiting the scope of the invention a brief summary of some of the claimed embodiments of the invention is set forth below. Additional details of the summarized embodiments of the invention and/or additional embodiments of the invention may be found in the Detailed Description of the Invention below.

A brief abstract of the technical disclosure in the specification is provided as well only for the purposes of complying with 37 C.F.R. 1.72. The abstract is not intended to be used for interpreting the scope of the claims.

BRIEF SUMMARY OF THE INVENTION

In at least one embodiment of the present invention the sparring apparatus may comprise a striking target and a mechanism for rotating the striking target substantially about a substantially vertical axis.

In at least another embodiment of the present invention the mechanism for rotating the target may comprise a motor.

In at least one embodiment of the present invention the mechanism for rotating the target may rest within a weighted base portion. In at least another embodiment of the present invention a rotating base portion may rotate.

In at least another embodiment of the present invention the motor may be a stepping motor. The stepping motor may be of the types: variable reluctance, permanent magnet, or hybrid depending on the torque and step requirements. In at least one embodiment of the invention high torque requirements may not be necessary such as when the present invention is used for timing practice.

In at least another embodiment of the present invention the stepping motor may have an angular resolution greater than 90 degrees per step. Each step may be less than 90 degrees.

In at least another embodiment of the present invention the stepping motor may have an angular resolution less than 1.8 degrees per step. Each step may be greater than 1.8 degrees.

In at least another embodiment of the present invention the stepping motor may have an angular resolution less than .72 degrees per step. Each step may be greater than .72 degrees.

In at least another embodiment of the present invention the stepping motor may be controlled by a control unit.

In at least one embodiment the control unit may be a computer, PLC, CPU, chip prom, or single chip micro-processor. Throughout the application PLC may refer to any of the group including a control unit, a computer, a PLC, a CPU, a chip prom, or a single chip micro-processor.

In at least one embodiment the control unit may include a program to move the motor in pre-designed sequences of movements.

In at least one embodiment the control unit may include a program to move the motor in sequences of movements determined by a random number generator.

In at least one embodiment the random number generator may generate values for determining the direction of the movement, the degrees of rotation of the movement, and/or the time interval of the movement.

In at least another embodiment of the present invention the control unit may run the motor in half-steps or in microsteps.

In at least another embodiment of the present invention the control unit may be programmed to randomly execute specific sequences of moves.

In at least another embodiment of the present invention the striking target may include a portion resembling a human torso and/or head.

In at least another embodiment of the present invention elongate members may extend from the striking target. While the elongate members may resemble the arms of a human being, they may also be merely elongate in shape with or without padding on their ends or along their length. The elongate members may stick straight out from the torso or they may be bent as at an elbow and/or wrist and/or shoulder. The elongate members may be made of a flexible material that flexes or moves upon impact.

In at least another embodiment of the present invention the striking target includes specific targets for purposes of improving aim and accuracy. The specific targets may be integrally a part of the striking body and/or may be applied with coloring agent and/or may be affixed to the striking body.

In at least another embodiment of the present invention the striking target flexes when struck.

In at least another embodiment of the present invention the head portion is movably engaged to the torso portion.

In at least another embodiment of the present invention the striking target can rotate over 360 degrees.

In at least another embodiment of the present invention the sparring apparatus resembles a human torso and head and has a striking target and a programmably controlled mechanism for rotating the striking target about a substantially vertical axis.

In at least another embodiment of the present invention the mechanism is controllably programmed to randomly execute specific sequences of moves.

In at least one embodiment the computer initiates a timer upon sending a movement command to the stepping motor. The timer may be designed to stop when the striking target is struck, and the time between the sending of the movement command and the striking of the striking target is capable of being recorded by the computer and printed.

In at least one embodiment the sensors communicating to the computer are disposed within the striking apparatus at certain locations in order to record the location struck on the striking target by a user.

In at least one embodiment the sensors communicate to the computer through wires or through a wireless system.

In at least one embodiment the sensors are disposed within the striking target, sparring gloves and sparring shoes, the sensors capable of being identified by the apparatus such that a record can be made of which portion of the target was struck and which foot or which hand struck the striking target.

These and other embodiments which characterize the invention are pointed out with particularity in the claims annexed hereto and forming a part hereof. However, for a better understanding of the invention, its advantages and objectives obtained by its use, reference should be made to the drawings which form a further part hereof and the accompanying descriptive matter, in which there is illustrated and described a preferred embodiment to the invention.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is a perspective view of a weighted base with a motor engaged to the base.

Fig. 1a is a perspective view of a motor.

Fig. 2 is a perspective view of a rotating base.

Fig. 2a is a bottom view of an embodiment of a rotating base.

Fig. 3 is a front view of the striking target.

Fig. 4 is an exploded view of the sparring apparatus.

Fig. 5 is an intact view of the sparring apparatus.

Fig. 6 is a front view of the striking target with elongate members attached.

Fig. 7 is a block diagram of communication paths.

Fig. 8 is a flow chart.

Detailed Description

While this invention may be embodied in many different forms, there are shown in the drawings and described in detail herein specific embodiments of the invention. The present disclosure is an exemplification of the principles of the invention and is not intended to limit the invention to the particular embodiments illustrated.

For the purposes of this disclosure, unless otherwise indicated, identical reference numerals used in different figures refer to the same component.

The sparring apparatus 10 may have a weighted base 20 as illustrated in Fig. 1. The weighted base 20 may be made of a heavy weight plastic and/or may have heavy weight items placed on or about it. Fig. 1 shows a base portion that is substantially cylindrical. The weighted base may also have a cross-section of a polygonal geometry. The weighted base 20 may be shaped such that a lower portion of the weighted base has a greater diameter or width than an upper portion of the base portion; such a geometry may allow weight to be placed on the weighted base to add stability. The weighted base may also be hollow for easier storage and shipping such that when the apparatus 10 is in use, stability can be added by adding sand or other heavy material. Water may also be used to add stability. The weighted base may contain a material that is a gel when exposed to water; this would prevent a possible leak or puncture from flooding the area around the sparring apparatus.

It should also be noted here that a computer, PLC, or CPU may be in the weighted base in order to record the readings from the timer and sensors. These readings may be used to determine reaction time, the area of the striking target struck, and the hand or foot involved in the striking. A display or printer may also be contained in the base 20 in order to display or print these results. These sensors may be wired to the computer, PLC, or CPU or to a wireless system. It should also be noted that the CPU, PLC, or computer may be separated from the weighted base 20 and the striking target 55 (best seen in Fig. 3) through the use of a wireless system which may transmit inputs from the sensors to the separated computer, PLC, or CPU.

The weighted base 20 may contain a cavity 25 sized to fit a motor 30. The motor 30 may provide the source rotation. The motor 30 may be a servo motor or a stepping motor which is capable of rotating in a variety of sequences and/or a specified number of degrees according to the commands programmed for the stepping motor. The motor allows the user/programmer to control the direction the striking target 55 rotates, how far the target rotates, the speed, acceleration, and deceleration of the rotation. The motor 30 also allows the user/programmer to control the hold time (pause between one rotation to the next). Having the ability to control all these variables allows the user/programmer to create a random yet specific sparring sequence which will allow the Tae Kwon Do or martial arts practitioner to work on their timing, which is critical for sparring. In addition, the user can kick the target with full force without worrying about injuring a sparring partner.

Though there are many ways in which one skilled in the art might chose to control the motion of the motor, in at least one embodiment the motion of the motor is controlled by a PLC which receives a signal from a switch that then sends a signal to the motor. In at least one embodiment the motion of the motor is controlled by a chip prom which sends a signal to the motor. The motor may be a servo motor which, upon receiving the signals, monitors the motor speed and location. In at least one other embodiment, the motor may be controlled by a microprocessor, PLC, computer, PIL, chip prom, or CPU.

The movements may be pre-programmed to command the motor (e.g. servo, stepping) toperform a sequence of movements. The program may come be a part of the servo motor. Upon writing the program, the program may be downloaded to the PLC. The PLC programs may be accessed by pushing a control switch. Chip proms may also be used as another way of controlling the motor.

An example of a program may be as follows:

1. Rotate 180 degrees CC (counter clockwise)
2. Rotate 180 degrees C (clockwise)
3. Rotate 45 degrees CC
4. Rotate 45 degrees C
5. Hold 2 seconds
6. Rotate 180 degrees C
7. Rotate 45 degrees C
8. Hold 1 second
9. Rotate 135 degrees C
10. Rotate 360 degrees C
11. Rotate 45 degrees CC
12. Rotate 45 degrees C
13. Hold 2.5 seconds
14. Rotate 720 degrees CC
15. End

The program/movement sequences may be pre-programmed into a PLC or burned onto a chip prom. There may also be different programs based on skill level: 1) beginner, 2) intermediate, 3) advanced. Within each of these level programs there may be 5-10 pre-determined subprograms that can be chosen. Thus, there may be a total of 15-30 programs a user can choose from.

The program may be looped for as long as the user wants to work out (e.g. 2-5 minutes). The speed of the rotation may also be programmed. The sequence of movements may be base on a timer which is initiated when a user hits a start switch. In other embodiments the timer restarts when the striking apparatus is struck and a new movement sequence begins. A random number generator may be used to make the movements more random. Some variables that may use the random number generator are the speed of the movement, the direction of the movement, the degrees of rotation of the movement, and the time interval of the movement.

Fig. 1a illustrates a motor 30 that may fit snugly in the cavity 25 of the weighted base 20.

Fig. 2 illustrates a rotating base 35. The rotating base 35 may be of many shapes. The rotating base may be substantially cylindrical, frustaconical, or may have a curved geometry as shown in Fig. 2. A target attachment portion 38 is shown near the top of the rotating base 35. The target attachment portion 38 may be an opening that may allow a portion of the target apparatus 55 to fixedly engage into the target attachment portion 38. On the other hand, a portion of the rotating base may fit into the bottom of the target apparatus.

The rotating base 35 of Fig. 2 may have a friction reducing portion 40. The friction reducing portion reduces the friction between the upper surface of the weighted base 20 and the bottom surface of the rotating base 35. The friction reducing portion 40 may be constructed and arranged such that rolling action such as ball bearings or weight bearing wheels as shown in Fig. 2a substantially reduce the friction between the two surfaces. Fig. 2a illustrates the bottom surface of rotating base 35. Rolling units 45 may include coasters, ball bearings, balls, and/or wheels. Motor 30 fittingly engages rotation orifice 50 of rotating base 35.

It should be noted that a liquid or gel lubricant may also be utilized between the upper surface of weighted base 20 and the lower surface of rotating base 35 with or without rolling action. Graphite like materials can also be used to reduce the friction between the surfaces.

A striking target 55 is shown in Fig. 3. The target may have the appearance of a human being, but may also have the appearance of an animal or of an inanimate object. The striking target may be made of material that flexes when struck. The head 60 of the striking target may also swivel or move on the torso 65 and may move more drastically than other portions of the striking target 55 when struck The striking target 55 may also be mounted on a support portion 70. The support portion 70 may have a recoil section 75 which may flex or recoil when struck. In some embodiments the recoil section may allow for more movement than any other portion of the striking apparatus. In at least one embodiment this recoil section may be constructed in part of a wire coil. It is also contemplated that the recoil section 75 may be made of plastics and/or rubbers that are less rigid than other portions of the striking target 55. Smaller geometries or thinner walls may also be used to make the recoil section 75 less rigid.

Shock sensor portions 80 may also be utilized in order to send a signal that can then be recorded in a memory device. These sensors 80 are used in determining the reaction time of the user as well as for recording the area struck. Sensors with a radio frequency identifier may also be placed in sparring gloves and shoes in order to record which foot or hand is making the strike.

Fig. 4 is an exploded view of a possible construction for the sparring apparatus 10 showing a striking target 55, a rotating base 35, a weighted base 20, and a motor 30. Fig. 5 is an intact view of an embodied sparring apparatus 10.

As shown in Fig. 6, in some embodiments of the invention elongate members 90 are incorporated into the striking target 55. These elongate members may be in the shape of arms or may merely be padded bars extending from the striking target 55.

A block diagram of the communication relationship of at least one embodiment of the invention is illustrated in Fig. 7. In Fig. 7 the programmable logic controller (PLC) 100 is shown to communicate with the timer 110 such that the user's reaction time may be determined. The shock sensors 120 as shown send an input to the PLC 100 each time a sensor records a shock or impact. In at least one embodiment the input from the shock sensor 120 stops the timer 110 and allows a time to be stored as output into the memory component 130 or it can be sent to a display 140. A full record of progress (for a session, day, week, month, year, etc.) may also be displayed by having multiple inputs from the memory 130 processed in the PLC 100 and sent as a report to the display 140. Additional data can also be recorded. In at least one embodiment, as shown in Fig. 7, the hand/foot sensors 150 may send inputs to the PLC 100. The hand/foot sensors 150 may wirelessly communicate such that the sensor 150 in the limb that made the strike has an identifier such as a radio frequency identifier (RFID) which provides an input to the PLC 100 which allows the limb making the strike to be differentiated from strikes made by other limbs having a different RFID. This input may also be processed by the PLC 100 and stored in memory 130 or be sent to the display 140.

As illustrated in the program flowchart of Fig. 8, in at least one embodiment of the invention the PLC may contains a program as is well known to one of ordinary skill in the art. In at least one embodiment, as shown in box 160, a command is sent to the motor from the PLC 100. The movement command may initiate the timer 110 as shown in box 170. The PLC sends the command to the motor and the movement begins 180. In at least one embodiment the user responds by striking the target as shown in box 190. This strike may be from a sensored or unsensored hand or foot. The PLC may receive inputs from the shock sensors upon the striking apparatus being struck 200. The time, location, and/or the limb of the strike may be recorded. This data may be processed 210 and the results displayed 220.

The above disclosure is intended to be illustrative and not exhaustive. This description will suggest many variations and alternatives to one of ordinary skill

in this art. All these alternatives and variations are intended to be included within the scope of the claims where the term "comprising" means "including, but not limited to". Those familiar with the art may recognize other equivalents to the specific embodiments described herein which equivalents are also intended to be encompassed by the claims.

Further, the particular features presented in the dependent claims can be combined with each other in other manners within the scope of the invention such that the invention should be recognized as also specifically directed to other embodiments having any other possible combination of the features of the dependent claims. For instance, for purposes of claim publication, any dependent claim which follows should be taken as alternatively written in a multiple dependent form from all prior claims which possess all antecedents referenced in such dependent claim if such multiple dependent format is an accepted format within the jurisdiction (e.g. each claim depending directly from claim 1 should be alternatively taken as depending from all previous claims, each claim depending directly from claim 2 should be alternatively taken as depending from all previous claims, etc.). In jurisdictions where multiple dependent claim formats are restricted, the following dependent claims should each be also taken as alternatively written in each singly dependent claim format which creates a dependency from a prior antecedent-possessing claim other than the specific claim listed in such dependent claim below (e.g. claim 4 may be taken as alternatively dependent from claim 2; claim 5 may be taken as alternatively dependent from claim 1, 2 or 3, claim 6 may be taken as alternatively dependent from claims 2-4 ; etc.).